



Homeland  
Security

SEP 13 2004

The Honorable Edward J. Markey  
U.S. House of Representatives  
Washington, DC 20515-2107

Dear Representative Markey:

On behalf of Secretary Ridge, thank you for your letter requesting the Department of Homeland Security to clarify the responses it provided to you in its May 19, 2004, letter concerning the insulation used on liquefied natural gas (LNG) carriers.

As explained by Coast Guard officials in their meeting with your staff on Monday, August 30, 2004, DHS' previous statement that foam polystyrene insulation was *not used* on LNG carriers was incorrect. However, I understand that Coast Guard officials provided your staff with a comprehensive briefing on LNG carriers' cargo containment systems. This included the types of insulation used and their likely performance in the event of a large LNG pool fire, as well as an overview of relevant design and equipment requirements for LNG carriers and the measures in place to ensure these vessels are in compliance with applicable requirements.

To briefly summarize the applicable safety requirements for LNG carriers:

- There is no U.S. mandated standard for LNG carrier cargo tank insulating material;
- All LNG carriers trading in the U.S. are designed and built to meet the requirements of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, commonly referred to as the "IGC Code"; and
- Additionally, all LNG carriers trading in the U.S. undergo plan review by the U.S. Coast Guard for issuance of a Letter of Authorization for the carriage of LNG cargo. These ships also undergo a physical examination to verify compliance with the requirements of the IGC Code, satisfactory material condition, and the proper operation of critical safety features prior to issuance of the Certificate of Compliance needed to operate in U.S. waters.

The Department recognizes the issues you raise, and the Coast Guard is working closely with Sandia National Labs to determine the necessary and appropriate requirements for future maritime shipment of LNG in U.S. waters. In light of the unique safety concerns associated with this cargo, the Coast Guard has instituted additional security measures to assure safe transit and cargo transfer operations by LNG carriers.

Let me now address the specific questions you posed in your June 21<sup>st</sup> letter:

*Q: Who in the federal government tests the insulation on LNG carriers for fire resistance?*

A. No federal entity tests insulation on LNG carriers. Testing of materials used in the construction of commercial vessels is typically performed by independent testing laboratories. In the United States, these laboratories are accredited in a process that takes several forms and involves multiple organizations, depending upon the location, customer base, and the particular test methods that are routinely performed. For example, the American Council of Independent Laboratories (ACIL) is the national trade association representing independent, commercial engineering and scientific laboratory, testing, consulting, product certifying, and R&D firms; manufacturer's laboratories; and consultants and suppliers to the industry.<sup>1</sup>

*Q: Who is responsible for determining whether this insulation is acceptable for use on LNG carrier vessels operating in US waters?*

A. The vessel's flag administration is responsible for determining that the insulation is in compliance with applicable requirements. The requirements for LNG carrier cargo tank insulation are specified in the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, commonly referred to as the "IGC Code." These requirements parallel the U.S. requirements in Title 46 Code of Federal Regulations, Part 154. Similar to the conditions discussed in the previous answer, required materials testing for foreign flag vessels is typically conducted to relevant international standards by independent testing labs. Presently, there are no U.S. flag LNG carriers, so foreign vessels that are in possession of a valid International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk ("IMO Certificate of Fitness") and have been issued a Certificate of Compliance by the U.S. Coast Guard are deemed acceptable for service in U.S. waters. As the Coast Guard informed your staff, the Certificate of Compliance process, a combination of plan review and on-board equipment testing and examination, is the process by which the Coast Guard ensures that foreign LNG carriers are in compliance with applicable requirements.

*Q: What are the standards used by the federal government for determining whether or not the insulating materials used on LNG carrier vessels are acceptable?*

A. As previously noted, the IGC Code, which parallels our domestic regulations for materials used for thermal insulation, specifies 14 properties<sup>2</sup> that materials used for thermal insulation must be tested for to ensure they are adequate for the intended service.

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<sup>1</sup> National Institute of Standards and Technology: NISTIR 6774  
Workshop On Fire Testing Measurement Needs: Proceedings August 2001

<sup>2</sup> International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, 1993 edition, Chapter 4.9.7.1

One of these properties is resistance to fire and flame spread. There are a number of standards that have been used to test resistance to fire and flame spread, such as: ASTM D 1692, “Rate of Burning of Cellular Plastics Using a Specimen Supported by a Horizontal Screen”; ASTM D 4986-98, “Test Method for Horizontal Burning Characteristics of Cellular Polymeric Materials”; European Standard ISO 3582, “Flexible cellular polymeric materials-Laboratory assessment of horizontal burning characteristics of small specimens subjected to a small flame”; and German Standard DIN 4102-1, “Fire behavior of building materials and elements.”

It is important to note that while the IGC Code requires testing for fire resistance and flame spread, there is no minimum performance standard because the tank insulation is installed in areas of the vessel protected by a double hull and steel weather cover that prevent it from exposure to flame under normal operating conditions.

*Q: What hazard analysis has been done to examine what would happen in the event that a fire on an LNG carrier vessel ignited the insulation or otherwise compromised it?*

A. As the Coast Guard explained to your staff, two of the most popular materials used to insulate LNG cargo tanks, polyurethane and polystyrene based foams, are used because they are especially well suited to maintaining the cargo at cryogenic temperature under ambient conditions. However, the chemical and physical properties that make these materials desirable as a cryogenic insulator render them undesirable as an insulator from the radiant heat that could be expected from an LNG pool fire that might result from the breach of a cargo tank. (Due to the location of the tanks within the vessel’s double hull and under a protective steel cover, it is highly unlikely that a flammable atmosphere would occur inside the vessel that would result in direct flame impingement on the insulation.) That said, the susceptibility of plastic foam-based insulation to decomposition under extreme fire load must be viewed in the context of the entirety of the vessel’s design, which includes the type of containment system under consideration (independent or membrane tank design), protection afforded by steel weather covers, cargo dome water spray systems, double hull construction, (and, in the case of membrane design LNG carriers, the capacity to flow ballast water through under deck tunnels) and the complexity of the thick, multi-layered insulation assembly itself, which includes components such as aluminum and fiberglass shielding which can provide a measure of thermal protection. The study now being conducted by Sandia National Labs is expected to examine how the cargo tank insulation would perform under an extreme fire load, and the degree to which insulation decomposition could affect the survivability of undamaged cargo tanks.

*Q: Are older ships required to be retrofitted with new insulation if they use insulating materials, like polystyrene, which have now been determined to be highly flammable? If not, why not? If so, how does the federal government verify that this has occurred?*

A. No, older ships are not required to be retrofitted. As previously explained, both polyurethane and polystyrene based foams are used as insulating material. There would be no significant difference in the performance of either of these materials in the event of an LNG pool fire that resulted from the breach of a cargo tank. Therefore, retrofitting would not enhance the safety of LNG carriers using either of these plastic based foams.

*Q: In light of the post 9-11 threat, is there any plan by the Department, or by the Coast Guard, to review the safety standards applicable to LNG carriers (including fire safety standards) to determine whether they need to be upgraded to address the threat of sabotage or terrorist attack?*

A. The Coast Guard considers the breach of an LNG cargo tank totally unacceptable given the severe potential consequences that could result from such a scenario. For more than 30 years, a healthy appreciation for the consequences of an uncontrolled LNG release has guided the LNG industry, the International Maritime Organization (IMO), the Coast Guard and its safety counterparts throughout the world in the development of vessel design, equipment, and operational measures intended to minimize the likelihood of a serious LNG incident. Accordingly, the LNG sector has one of the most enviable safety records in the marine industry.

As one of the influential members of the IMO, the Coast Guard had, and continues to have, a very significant role in the development and continuing evolution of the IGC Code. The Coast Guard and its international partners continue to monitor developments that may impact the safety and security of the marine LNG industry and, where appropriate, will recommend changes to enhance safety and security.

In response to the new threats posed in today's environment, the Coast Guard has focused additional attention and resources on LNG vessels, including escorts, security boardings, and engagement with LNG terminals and vessel operators to ensure that the security plans and procedures required by the Maritime Transportation Security Act (MTSA) and International Ship and Port Facility Security (ISPS) Code are scrupulously applied.

*Q: In the event that fire compromises the insulation on an LNG carrier vessel, does the Department of Homeland Security agree that it is possible for the relief valves to be incapable of handling the increased vapor pressure?*

A. The IGC Code<sup>3</sup> provides the formula for calculating relief valve capacity. This formula is based on US regulations that provided a very conservative (i.e., erring on the side of safety) figure for determining relieving capacity. Information obtained from the designers of both the Moss and membrane design carriers indicate that undamaged cargo tanks should be able to withstand the expected fire load from an LNG pool fire resulting from a breached cargo tank without over-pressuring the containment system.

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<sup>3</sup> International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, 1993 edition, Chapter 8.5

*Q: Has the Department done any analysis of the consequences of such an occurrence? If so, what has it concluded? If not, why has such an analysis not been performed?*

A. The Department has not performed such a consequence analysis. As previously mentioned, Sandia National Labs is now looking into the effect the loss of insulation may have on the survivability of previously undamaged cargo tanks. Once this information becomes available, DHS will compare it to the information the Coast Guard has received from the cargo containment system designers. Should there be any discrepancies between the information obtained from these sources, the Department will take appropriate action to ensure the matter is clarified.

*Q: How does the adoption of additional operational security measures suffice to address an issue brittle fracture - that seems to go to the fundamental design of an LNG tanker?*

A. There is no economically feasible engineering or design solution that could mitigate the consequences of tens of thousands of gallons of LNG dispersing through a damaged LNG carrier's cargo hold. Therefore, the Coast Guard has put into place a variety of operational measures designed to minimize the occurrence of scenarios that could produce such an event. For example, the Coast Guard has implemented vessel traffic management arrangements that significantly reduce the possibility of collisions that could cause a breach of a cargo containment system. Security zones, vessel escorts, establishing "positive control" over the vessel during its transit, and engagement with state and local law enforcement, emergency management, and public safety entities are intended to minimize the likelihood of a successful terrorist attack against an LNG carrier.

*Q: Might not terrorist threats require the use of additional measures to address the problem of brittle fracture of the ship's hull resulting from an LNG spill?*

A. The Department agrees with the Coast Guard's position that the breach of an LNG cargo tank is unacceptable. Accordingly, as described above, the Coast Guard has implemented the most rigorous safety and security measures possible to prevent this from occurring.

*Q: If so, what types of changes might be needed in the design and construction of LNG carrier vessels?*

A. As previously noted, there is no economically feasible engineering or design solution that could mitigate the consequences of a large scale LNG release on the vessel's hull.

*Q: Is the Department studying whether design changes might be needed to better protect LNG tankers from threats of terrorism or sabotage, or to mitigate the consequences of such attacks?*

A. As the Department's authority on maritime safety and security issues, the Coast Guard has assisted the Department of Energy and Sandia National Labs on their study of LNG vessels' vulnerability to terrorist incidents. Once the report is completed and released, the Coast Guard will carefully review the findings to determine if additional LNG vessel safety and security measures, both design and operational, or policy changes, are warranted.

I assure you that the Department and the Coast Guard take LNG vessel safety and security with the utmost seriousness. The Department recognizes the importance that LNG plays in our nation's energy picture and the unique risks inherent in the marine transportation of LNG. A significant LNG vessel casualty or terrorist incident is simply unacceptable. Although risk can never be entirely eliminated, I am confident that the Department and the Coast Guard are taking all appropriate measures to responsibly manage the risks of LNG marine transportation.

I appreciate your interest in the Department of Homeland Security, and I look forward to working with you on future homeland security issues. If I may be of further assistance, please contact the Office of Legislative Affairs at (202) 205-4412.

Sincerely,

A handwritten signature in black ink, appearing to read "Pamela J. Turner". The signature is fluid and cursive, with the first name "Pamela" being more prominent than the last name "Turner".

Pamela J. Turner

Assistant Secretary for Legislative Affairs